

Claims:

1. A rotary electric machine of alternating current type designed to be connected directly to a distribution or transmission network and comprising at least one electric winding, characterized in that the winding comprises at least one electric conductor, a first layer with semiconducting properties surrounding the conductor, a solid insulating layer surrounding the first layer and a second layer with semiconducting properties surrounding the insulating layer, and also in that a brushless excitation system, switchable between positive and negative excitation, is arranged for excitation of the machine.

2. A machine as claimed in claim 1, characterized in that the potential on the first layer is substantially equal to the potential on the conductor.

3. A machine as claimed in claim 1 or claim 2, characterized in that the second layer is arranged to form a substantially equipotential surface surrounding the conductor.

4. A machine as claimed in claim 3, characterized in that the second layer is connected to a predetermined potential.

5. A machine as claimed in claim 4, characterized in that said predetermined potential is earth potential.

6. A machine as claimed in any of the preceding claims characterized in that at least two adjacent layers of the machine's winding have substantially equally large coefficients of thermal expansion.

7. A machine as claimed in any of the preceding claims characterized in that the conductor comprises a number of strands, at least some of which are in electric contact with each other.

8. A machine as claimed in any of the preceding claims, characterized in that each of said three layers is firmly joined to adjacent layers along substantially its entire contact

surface.

9. A machine as claimed in any of the preceding claims, characterized in that said layers are arranged to adhere to each other even when the insulated conductor is bent.

5 10. A machine comprising at least one main electric machine of alternating current type designed to be connected directly to a distribution or transmission network and comprising at least one magnetic core and at least one electric winding, characterized in that the winding is formed from a cable comprising one or more current-carrying conductors, each conductor having a number of strands, an inner semiconducting layer arranged around each conductor, an insulating layer of solid insulating material arranged around said inner semiconducting layer, and an outer semiconducting layer arranged around the insulating layer, and in that a brushless excitation system, switchable between positive and negative excitation, is arranged for excitation of the machine.

10 11. A machine as claimed in claim 10, characterized in that said cable comprises a metal screen or sheath.

15 12. A machine as claimed in any of the preceding claims, characterized in that the excitation system comprises two controllable antiparallel-connected current converter devices for feeding the field winding of the alternating current machine, a two-way field over-voltage protection means or discharge circuit connected across the field winding, and control equipment for controlling current converters and field over-voltage protection means or discharge circuit.

20 13. A machine as claimed in claim 12, characterized in that for switching the direction of the excitation current from the excitation system, the control equipment is arranged to change the polarity of the current converters, the control equipment causing the over-voltage protection means to be temporarily connected at transition from one to the other current direction.

25 14. A machine as claimed in claim 12 or claim 13 characterized in that the over-

voltage protection means or the discharge circuit comprises a two-way thyristor discharge circuit.

5 15. A machine as claimed in any of claims 12-14, characterized in that an activated over-voltage protection means or discharge circuit can be reset by control of conducting converter devices to temporary or pulse-formed change of polarity.

16. A machine as claimed in any of claims 12-14, characterized in that an activated over-voltage protection means or discharge circuit can be reset by means of extinguishable semiconductor elements.

10 17. An electric power plant, characterized in that it comprises a rotary electric machine as claimed in any of claims 1-16.

18. A method of exciting a rotary electric machine with both positive and negative excitation current direction, characterized in that a two-way field over-voltage protection means or a two-way discharge circuit is connected temporarily across the field winding of the machine when switching between excitation current directions.